

REMARKS

Claims 1-4, 6-8 and 10 are pending in this application. By this Amendment, claims 1-4, 6-8 and 10 are amended. No new matter is added

Applicants thank the Examiner for the courtesies extended in a February 9, 2005, personal interview with Applicants' undersigned representative, during which the outstanding rejections of record were discussed. The remainder of Applicants' separate record of the personal interview are contained in the remarks below.

The Office Action rejects claims 1-3 and 10 under 35 U.S.C. § 102(e) as being anticipated by Matsukawa et al. (U.S. Patent No. 6,153,326). Claim 4 is rejected under 35 U.S.C. § 102(e) as being anticipated by or, in the alternative, under 35 U.S.C. § 103(a) as being obvious over Matsukawa et al. Claims 6-8 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Steck et al. (U.S. Patent No. 5,464,700) in view of Matsukawa et al. These rejections are traversed as they may apply to the amended claims.

Claim 1 has been amended as suggested by the Examiner to define a polymer electrolyte membrane fuel cell. Thus, as amended, the present claims recite that a liquid thermosetting sealing agent is utilized to form a seal in the claimed polymer electrolyte fuel cell, which also comprises a lamination of separators and a membrane electrode assembly. The purpose of using the seal is to tightly seal gaps between each separator and the membrane electrode assembly. The seal is formed by applying the liquid thermosetting sealing agent into gaps between each separator and the membrane electrode assembly, and then thermally curing the liquid thermosetting sealing agent at a temperature in the range of from 100 to 130°C over a period of from 1 to 5 hours, and the controlled temperature range thereof is a predetermined temperature $\pm 5^{\circ}\text{C}$. The seal this

formed adheres to both the separator and the membrane electrode assembly. The liquid thermosetting sealing agent is based on a silicone series elastomer or isobutylene series elastomer, and the viscosity of the liquid thermosetting sealing agent at the application is from 1,000 to 9,000 Pa.s.

The extreme difference between the sealing agent of the present invention and that of the cited references is the fact that the sealing agent utilized in the present invention seals the gap between each separator and MEA, while the sealing agent described in the cited reference is for use injection molding. The aim of the present invention is a seal having a required shape on the opening space (the gap between each separator and the membrane electrode assembly) by means of spraying a liquid sealing agent by a nozzle over the opening space.

In the process of forming a seal on the opening space, when a viscosity of the sealing agent is too low, the seal cannot be formed into a required shape since the sealing agent can hardly be cured immediately after being sprayed. To the contrary, when a viscosity of the sealing agent is too high, the sealing agent is sprayed from the nozzle under the high pressure to the opening space of the separator since the nozzle is thin.

Specifically, before the sealing agent is sprayed out of the nozzle, the sealing agent is under a high pressure. After the sealing agent is sprayed out of the nozzle, the sealing agent is being under the atmospheric pressure. Thus, when the sealing agent is applied into the opening space, bubbles are easily generated in the sealing agent due to the above pressure difference. Consequently, when such liquid sealing agent is cured, a seal having a uniform thickness can be hardly formed on the opening space.

Under the consideration of the above phenomena, the viscosity of the sealing agent described in claim 1 is defined by a range of from 1,000 to 9,000 Pa.s.

Matsukawa et al. is directed to a silicone resin-metal composite. In particular, the Matsukawa et al. "invention is characterized by formation of a silicone resin layer by injection molding" (column 2, lines 41-42). Matsukawa et al. thus only teach a metal plate having a silicone resin layer injection molded thereon. Nowhere do Matsukawa et al. teach or suggest that there silicone resin layer could be formed between layers, let alone that their required injection molding procedure could be replaced by the process utilized to form the fuel cell of the present invention. Furthermore, the Matsukawa procedure would not be expected to achieve a shape that fills the gaps between each separator and membrane assembly.

Thus, as Matsukawa et al. does not teach or suggest the elements required by the present claims, the present claims can not be anticipated by and would not have been obvious over Matsukawa et al.

Steck et al. shows a gasketed membrane electrode assembly for electrochemical fuel cells. However, Steck et al. fails to teach or suggest replacing a injection molding process, such as that required by Matsukawa et al., with a procedure such as that utilized to form the presently claimed fuel cell, and thus fails to make up for the deficiencies in Matsukawa et al. Thus, the present claims would not have been obvious over the combination of Matsukawa et al. and Steck et al.

For at least the above reasons, reconsideration and withdrawal of the rejections of claims 1-3 and 10 under 35 U.S.C. § 102(e) and of claim 4 under 35 U.S.C. § 102(e) or, in

the alternative, under 35 U.S.C. § 103(a), and of claims 6-8 under 35 U.S.C. § 103(a) are respectfully requested.

Applicants respectfully submit that this application is in condition for allowance and such action is earnestly solicited. If the Examiner believes that anything further is desirable in order to place this application in even better condition for allowance, the Examiner is invited to contact Applicants' undersigned representative at the telephone number listed below to schedule a personal or telephone interview to discuss any remaining issues.

In the event this paper is not being timely filed, Applicants respectfully petition for an appropriate extension of time. Any additional fees may be charged to Counsel's Deposit Account 01-2300, **referencing attorney docket number 106145-00029.**

Respectfully submitted,

A handwritten signature in black ink, reading "Robert K. Carpenter", written over a horizontal line.

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